Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (previously presented): A method for training a system to inspect a spatially distorted pattern, the method comprising:

receiving a digitized image of an object, the digitized image including a region of interest;

dividing the region of interest in its entirety into a plurality of non-overlapping sub-regions, a size of each of the non-overlapping sub-regions being small enough such that an image-feature-position-based inspecting tool can reliably inspect each of the sub-regions;

training only a fine search tool and an image-feature-position-based inspection tool for a respective single model for each of the plurality of non-overlapping sub-regions;

building a single search tree for determining an order for inspecting each non-overlapping sub-region of the plurality of non-overlapping sub-regions at a run-time; and

training a coarse alignment tool for the region of interest in its entirety so as to enable providing at run time an approximate location for a root sub-region of the single search tree.

Claim 2 (previously presented): The method according to claim 1, wherein the size of each of the non-overlapping sub-regions is small enough such that each of the sub-regions is well-approximated by an affine transformation.

Claim 3 (previously presented): The method of claim 1, wherein the building of the single search tree comprises:

establishing the order so that location information for located ones of the non-overlapping sub-regions is used to minimize a search range for neighboring ones of the non-overlapping sub-regions.

Claim 4 (previously presented): The method of claim 1, wherein the training of only the fine search tool for the respective single model for each of the plurality of non-overlapping sub-regions is performed by using a correlation search.

Claim 5 (previously presented): The method of claim 1, wherein the training of the image-feature-position-based inspection tool for the respective single model for each of the plurality of non-overlapping sub-regions is performed by using a golden template comparison method.

Claim 6 (previously presented): A method for inspecting a spatially distorted pattern, the method comprising:

running a coarse alignment tool to approximately locate the spatially distorted pattern in its entirety within a region of interest so as to provide an approximate location for a root sub-region of a single search tree;

running only a fine alignment tool in an order according to the single search tree, and using the approximate location of the root sub-region to locate a plurality of non-overlapping sub-regions within the region of interest so as to provide fine location information, the non-overlapping sub-regions covering the region of interest in its entirety, each of the non-overlapping sub-regions being of a size small enough such that an image-feature-position-based inspecting method can reliably inspect each of the non-overlapping sub-regions using respective single models;

inspecting each of the non-overlapping sub-regions using the fine location information and the image-feature-position-based inspecting method so as to produce a difference image for each of the non-overlapping sub-regions.

Claim 7 (previously presented): The method of claim 6, further comprising:

comparing the fine location information with model location information so as to provide a distortion vector for each non-overlapping sub-region;

combining all distortion vectors, one for each non-overlapping sub-region, so as to produce a distortion vector field; and

using the distortion vector field to make a pass/fail decision based on user-specified tolerances.

Claim 8 (previously presented): The method of claim 6, wherein:

the inspecting using the fine location information and the image-feature-position-based inspecting method produces a match image for each of the non-overlapping sub-regions, the method further comprising:

combining the difference images for each of the non-overlapping sub-regions into a single difference image; and

combining the match images for each of the non-overlapping sub-regions into a single match image.

Claim 9 (previously presented): The method of claim 7, wherein:

the inspecting using the fine location information and the image-feature-position-based inspecting method produces a difference image for each of the non-overlapping sub-regions and a match image for each of the non-overlapping sub-regions, the method further comprising:

combining the difference images for each of the non-overlapping sub-regions into a single difference image;

combining the match images for each of the non-overlapping sub-regions into a single match image;

comparing the fine location information with model location information so as to provide a distortion vector for each non-overlapping sub-region; and

combining all distortion vectors, one for each non-overlapping sub-region, so as to produce a distortion vector field.

Claim 10 (previously presented): The method according to claim 6, wherein the size of each of the non-overlapping sub-regions is small enough such that each of the non-overlapping sub-regions is well approximated by an affine transformation.

Claim 11 (previously presented): The method of claim 6, further comprising:

using the fine location information from located ones of the non-overlapping sub-regions to interpolate location information for a non-overlapping sub-region when the non-overlapping sub-region cannot be located; and

inspecting the non-overlapping sub-region based on the interpolated location information.

Claim 12 (previously presented): The method of claim 6, further comprising:

using respective single models for at least some of the non-overlapping sub-regions to determine respective fine location information; and

predicting fine location information in at least one of the non-overlapping sub-regions by using the respective fine location information of neighboring ones of the at least some of the non-overlapping sub-regions when the at least one of the non-overlapping sub-regions cannot be located by running the fine alignment tool.

Claim 13 (previously presented): The method of claim 6, wherein the inspecting of each of the non-overlapping sub-regions using an image-feature-position-based inspecting method is performed by a golden-template comparison method.

Claim 14 (previously presented): An apparatus for inspecting a spatially distorted pattern, the apparatus comprising:

a memory for storing a digitized image of an object;

a region divider for dividing the digitized image of a region of interest in its entirety into a plurality of non-overlapping sub-regions, the non-overlapping sub-regions covering the region of interest completely, a size of each of the non-overlapping sub-regions being small enough such that an image-feature-position-based inspecting method can reliably inspect each of the non-overlapping sub-regions;

a coarse alignment tool for approximately locating the pattern so as to provide an approximate location for a root sub-region of a single search tree;

a fine search tool only for locating each of the non-overlapping sub-regions sequentially in an order based on the single search tree; and

an image-feature-position-based inspector for inspecting each of the non-overlapping sub-regions.

Claim 15 (previously presented): The apparatus of claim 14, further comprising:

a vector field producer to combine all location information to produce a distortion vector field for each of the non-overlapping sub-regions; and

a comparing mechanism for using the distortion vector field to make a pass/fail decision based on user specified tolerances.

Claim 16 (previously presented): The apparatus of claim 14, wherein:

the image-feature-position-based inspector for inspecting each of the non-overlapping sub-regions produces a difference image for each of the non-overlapping sub-regions and a match image for each of the non-overlapping sub-regions, the apparatus further comprises:

a first combiner for combining the difference images for each of the non-overlapping sub-regions into a single difference image; and

a second combiner for combining the match images for each of the non-overlapping sub-regions into a single match image.

Claim 17 (previously presented): The apparatus according to claim 14, wherein the size of each of the non-overlapping sub-regions is small enough such that each of the non-overlapping sub-regions is well-approximated by an affine transformation.

Claim 18 (previously presented): The apparatus of claim 14, further comprising:

an interpolator for using location information from located ones of the non-overlapping sub-regions to interpolate location information for a non-overlapping sub-region when the non-overlapping sub-region cannot be located by the fine search tool; wherein

the image-based inspector inspects the non-overlapping sub-region based on the interpolated location information.

Claim 19 (previously presented): The apparatus of claim 14, further comprising:

an interpolator for using the respective models for at least some of the non-overlapping sub-regions to determine respective location information, and for predicting location information in at least one of the non-overlapping sub-regions by using the respective location information of neighboring ones of the at least some of the non-overlapping sub-regions when the at least one of the non-overlapping sub-regions cannot be located.

Claim 20 (previously presented): The apparatus of claim 14, wherein the image-feature-position-based inspector inspects each of the non-overlapping sub-regions by using a golden-template comparison method.

Claim 21 (previously presented): An apparatus for inspecting a spatially distorted pattern, the apparatus comprising:

a storage for storing a digitized image of an object, the digitized image including a region of interest;

a region divider for dividing the region of interest in its entirety into a plurality of non-overlapping sub-regions, a size of each of the non-overlapping sub-regions being small enough such that an image-feature-position-based inspecting method can reliably inspect each of the non-overlapping sub-regions;

a trainer for training a respective single model for a fine search tool only and for an image-feature-position-based inspector for each of the plurality of non-overlapping sub-regions;

a search tree builder for building a single search tree for determining an order for image-feature-position-based inspecting of each sub-region of the plurality of non-overlapping sub-regions at a run time;

a coarse alignment trainer;

a coarse alignment tool for approximately locating the pattern so as to provide an approximate location for a root sub-region of a single search tree, the coarse alignment tool being configured to be trained by the coarse alignment trainer;

a fine search tool only for locating each of the non-overlapping sub-regions sequentially in an order based on the single search tree, the root sub-region of the single search tree being provided by the coarse alignment tool; and

an image-based inspector for inspecting each of the non-overlapping sub-regions.

Claim 22 (previously presented): The apparatus according to claim 21, further comprising:

a vector field producer to combine all location information to produce a distortion vector field for each of the non-overlapping sub-regions; and

a comparing mechanism for using the distortion vector fields to make a pass/fail decision based on user specified tolerances.

Claim 23 (previously presented): The apparatus of claim 21, wherein:

the image-feature-position-based inspector produces a difference image for each of the non-overlapping sub-regions and a match image for each of the non-overlapping sub-regions, the apparatus further comprises:

a first combiner for combining the differences images for each of the non-overlapping sub-regions into a single difference image; and

a second combiner for combining the match images for each of the non-overlapping sub-regions into a single match image.

Claim 24 (previously presented): The apparatus according to claim 21, wherein the size of each of the non-overlapping sub-regions is small enough such that each of the non-overlapping sub-regions is well approximated by an affine transformation.

Claim 25 (previously presented): The apparatus of claim 21, wherein the building of the single search tree comprises:

establishing the order so that location information for located ones of the non-overlapping sub-regions is used to minimize a search range for neighboring ones of the non-overlapping sub-regions.

Claim 26 (previously presented): The apparatus of claim 21, further comprising:

an interpolator for using location information from located ones of the non-overlapping sub-regions to interpolate location information for a non-overlapping sub-region when the sub-region cannot be located, wherein

the image-feature-position-based inspector inspects the previously unlocated non-overlapping sub-region based on the interpolated location information.

Claim 27 (previously presented): A medium having a stored therein machine-readable information, such that when the machine-readable information is read into a memory of a computer and executed, the machine-readable information causes the computer:

to receive a digitized image of an object, the digitized image including a region of interest;

to divide the region of interest in its entirety into a plurality of non-overlapping sub-regions, a size of each of the non-overlapping sub-regions being small enough such that an image-feature-position-based inspecting method can reliably inspect each of the non-overlapping sub-regions;

to train a respective single model for a fine search tool only and for an image-feature-position-based inspection tool for each of the plurality of non-overlapping sub-regions;

to build a single search tree for determining an order for inspecting the plurality of non-overlapping sub-regions at a run-time; and

to train a respective model for a coarse alignment tool so as to enable providing at run time an approximate location for a root sub-region of the single search tree.

Claim 28 (previously presented): The medium of claim 27, wherein when building the single search tree, the machine-readable information causes the computer:

to establish the order so that location information for located ones of the non-overlapping sub-regions is used to minimize a search range for neighboring ones of the non-overlapping sub-regions.

Claim 29 (previously presented): The medium of claim 27, wherein the machine-readable information further causes the computer:

to run a coarse alignment tool to approximately locate a pattern so as to provide an approximate location for a root sub-region of a single search tree.;

to run only a fine alignment tool in an order according to the single search tree and using the approximate location of the root sub-region approximately located by the coarse alignment tool to locate a plurality of non-overlapping sub-regions so as to provide fine location information, each of the non-overlapping sub-regions being of a size small enough such that an image-feature-position-based inspecting method can reliably inspect each of the non-overlapping sub-regions; and

to perform image-based inspection of each of the non-overlapping sub-regions to produce a difference image for each of the non-overlapping sub-regions and a match image for each of the non-overlapping sub-regions.

Claim 30 (previously presented): The medium of claim 29, wherein the machine-readable information further causes the computer:

to combine the difference images for each of the non-overlapping sub-regions into a single difference image; and

to combine the match images for each of the non-overlapping sub-regions into a single match image.

Claim 31 (previously presented): The medium of claim 29, wherein the machine-readable information further causes the computer:

to compare the fine location information with model location information so as to provide a distortion vector for each non-overlapping sub-region;

to combine all distortion vectors, one for each non-overlapping sub-region, so as to produce a distortion vector field; and

to use the distortion vector field to make a pass/fail decision based on user-specified tolerances.

Claim 32 (previously presented): The medium of claim 27, wherein the machine-readable information further causes the computer:

to use fine location information from located ones of the non-overlapping sub-regions to interpolate fine location information for a non-overlapping sub-region when the non-overlapping sub-region cannot be located; and

to run an image-feature-position-based inspection tool on the non-overlapping sub-region based on the interpolated fine location information.

Claim 33 (previously presented): The method of claim 6, further comprising:

dividing one of the non-overlapping sub-regions into a plurality of smaller non-overlapping sub-regions when the one of the non-overlapping sub-regions cannot be located using a fine search tool.

Claim 34 (previously presented): A method for inspecting a spatially distorted pattern, the method comprising:

running a coarse alignment tool to approximately locate the pattern so as to provide an approximate location for a root sub-region of a single search tree;

running only a fine alignment tool in an order according to the single search tree, and using the approximate location of a the root sub-region, to locate a plurality of non-overlapping sub-regions so as to provide fine location information, each of the non-overlapping sub-regions being of a size small enough such that an image-feature-position-based inspecting method can reliably inspect each of the non-overlapping sub-regions;

comparing the fine location information with model location information so as to provide a distortion vector for each non-overlapping sub-region;

combining all distortion vectors, one for each non-overlapping sub-region, so as to produce a distortion vector field; and

using the distortion vector field to make a pass/fail decision based on user-specified tolerances.

Claim 35 (previously presented): An apparatus for inspecting a spatially distorted pattern, the apparatus comprising:

a memory for storing a digitized image of an object;

a region divider for dividing the digitized image of a region of interest in its entirety into a plurality of non-overlapping sub-regions, a size of each of the non-overlapping sub-regions being small enough such that an image-feature-position-based inspecting method can reliably inspect each of the non-overlapping sub-regions;

a coarse alignment tool for approximately locating the pattern so as to provide an approximate location for a root sub-region of a single search tree;

a fine search tool only for locating each of the non-overlapping sub-regions sequentially in an order based on the single search tree so as to provide fine location information;

a vector field producer for comparing the fine location information with model location information so as to provide a distortion vector for each non-overlapping sub-region, and for combining the distortion vectors to produce a distortion vector field; and

a comparing mechanism for using the distortion vector field to make a pass/fail decision based on user specified tolerances.

Claim 36 (previously presented): A medium having stored therein machine-readable information, such that when the machine-readable information is read into a memory of a computer and executed, the machine-readable information causes the computer:

to run a coarse alignment tool to approximately locate a pattern so as to provide an approximate location for a root sub-region of a single search tree;

to run only a fine alignment tool in an order according to the single search tree using the root sub-region approximately located by the coarse alignment to locate a plurality of non-overlapping sub-regions so as to provide fine location information, each of the non-overlapping sub-regions being of a size small enough such that an image-feature-position-based inspecting method can reliably inspect each of the non-overlapping sub-regions;

to compare the fine location information with model location information so as to provide a distortion vector for each non-overlapping sub-region;

to combine all distortion vectors , one for each non-overlapping sub-region, so as to produce a distortion vector field; and

to use the distortion vector field to make a pass/fail decision based on user-specified tolerances.